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GB 2112585 A **GB 2062361 A**

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(54) Enclosures for generator sets

(57) An enclosure for a generator driven by an I.C. engine and suitable for use in exposed locations includes a cooling air intake (44) and a cooling air outlet (46), both arranged to prevent ingress of water, including salt water, and airborne particles to the enclosure. The intake (44) and outlet (46) each include means defining a tortuous air path, and means for deflecting water when the generator is not operating. The intake (44) may be provided with an air filter (5). The outlet (46) may have a louvre(s) operative to open and close on start up and shut down respectively of the generator. The louvre(s) may be opened by pressure of oil from the engine, or by the air flow. Access doors are provided with seals. The intake and outlet may have firedampers having fusible links.

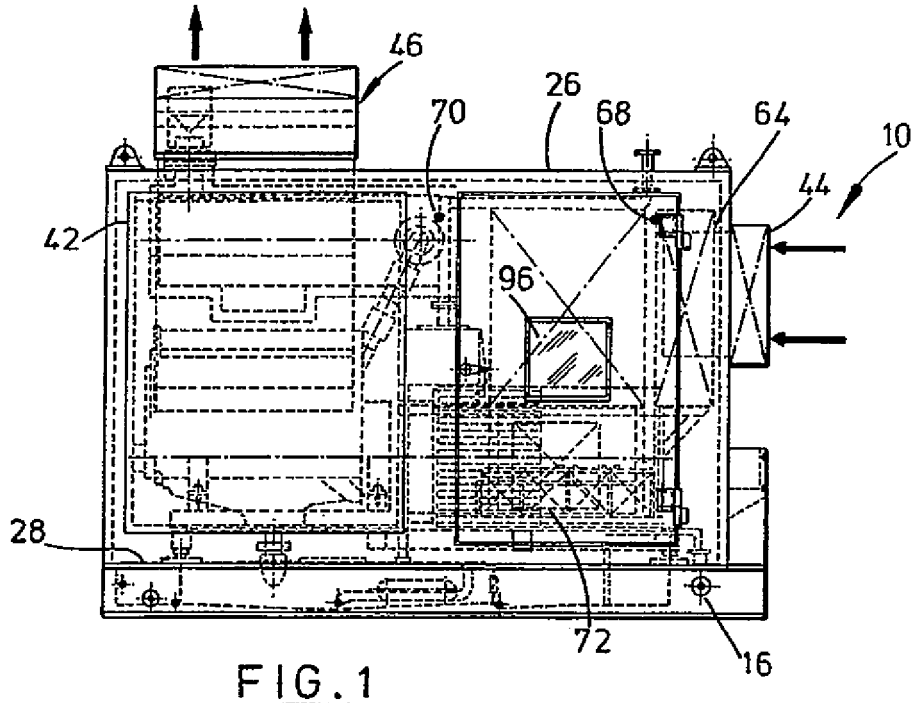

FIG. 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

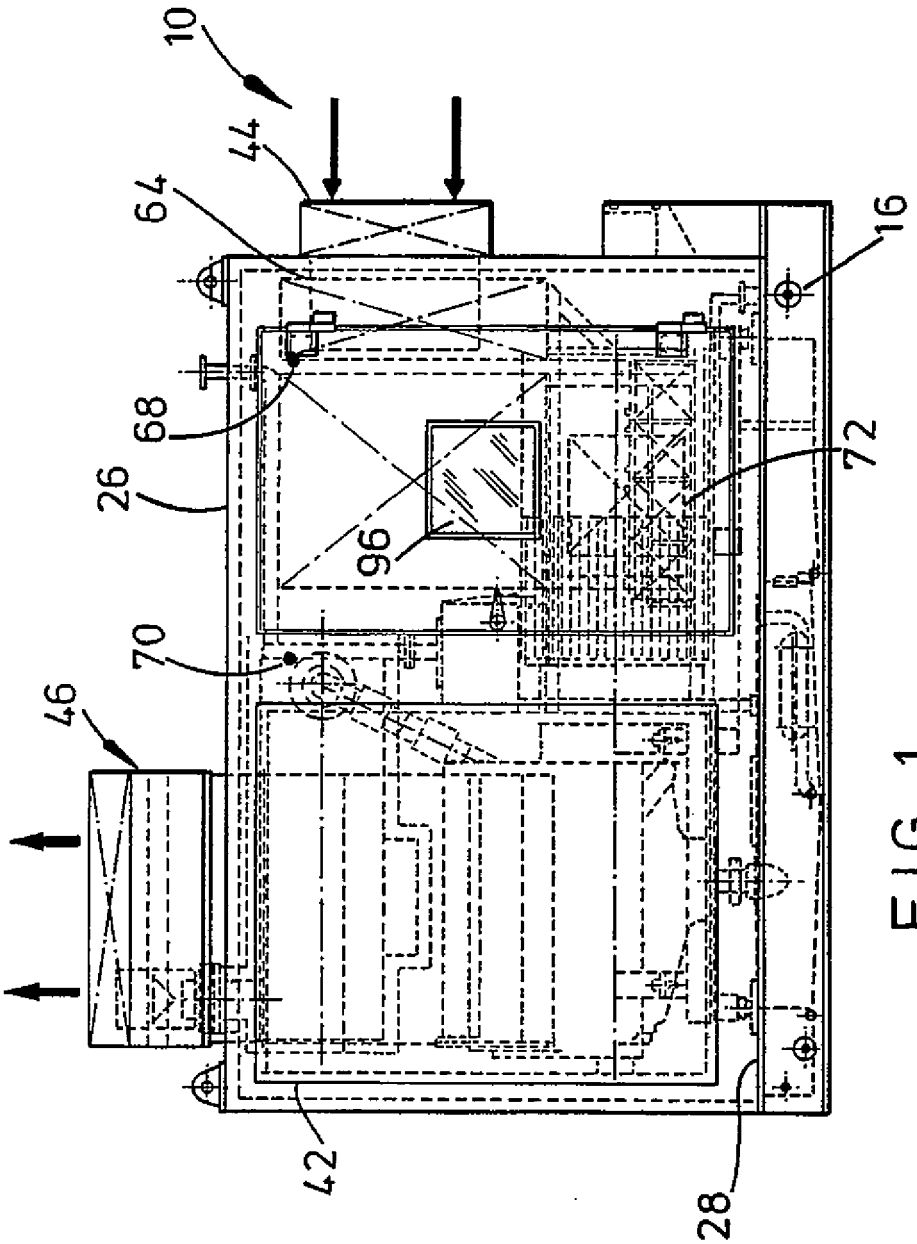

FIG. 1

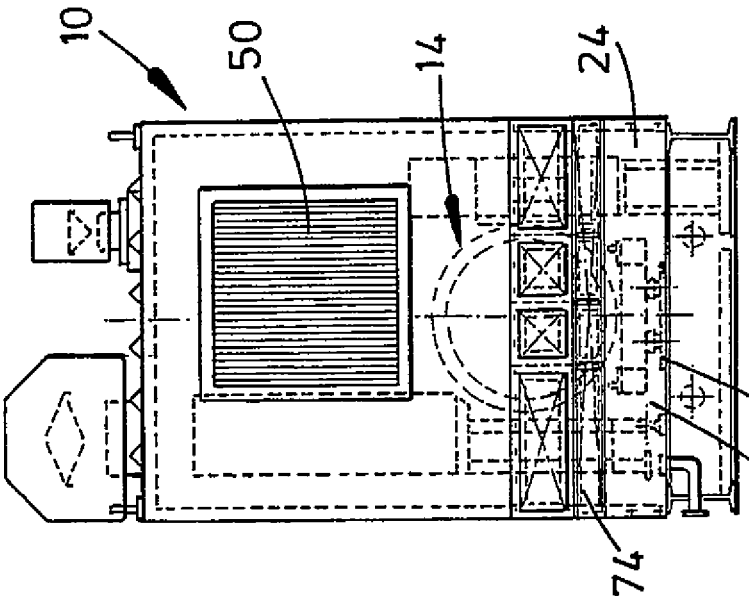

FIG.3

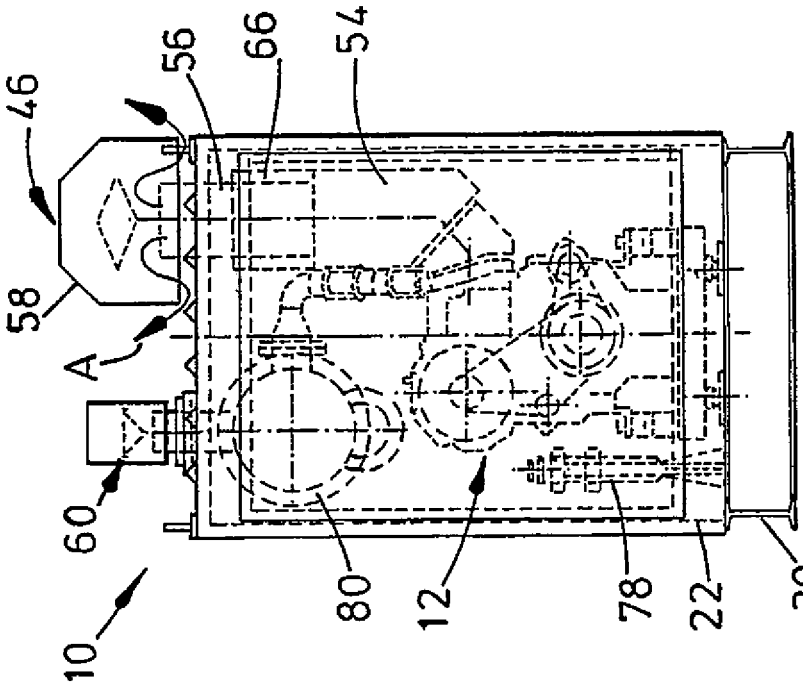

FIG.2

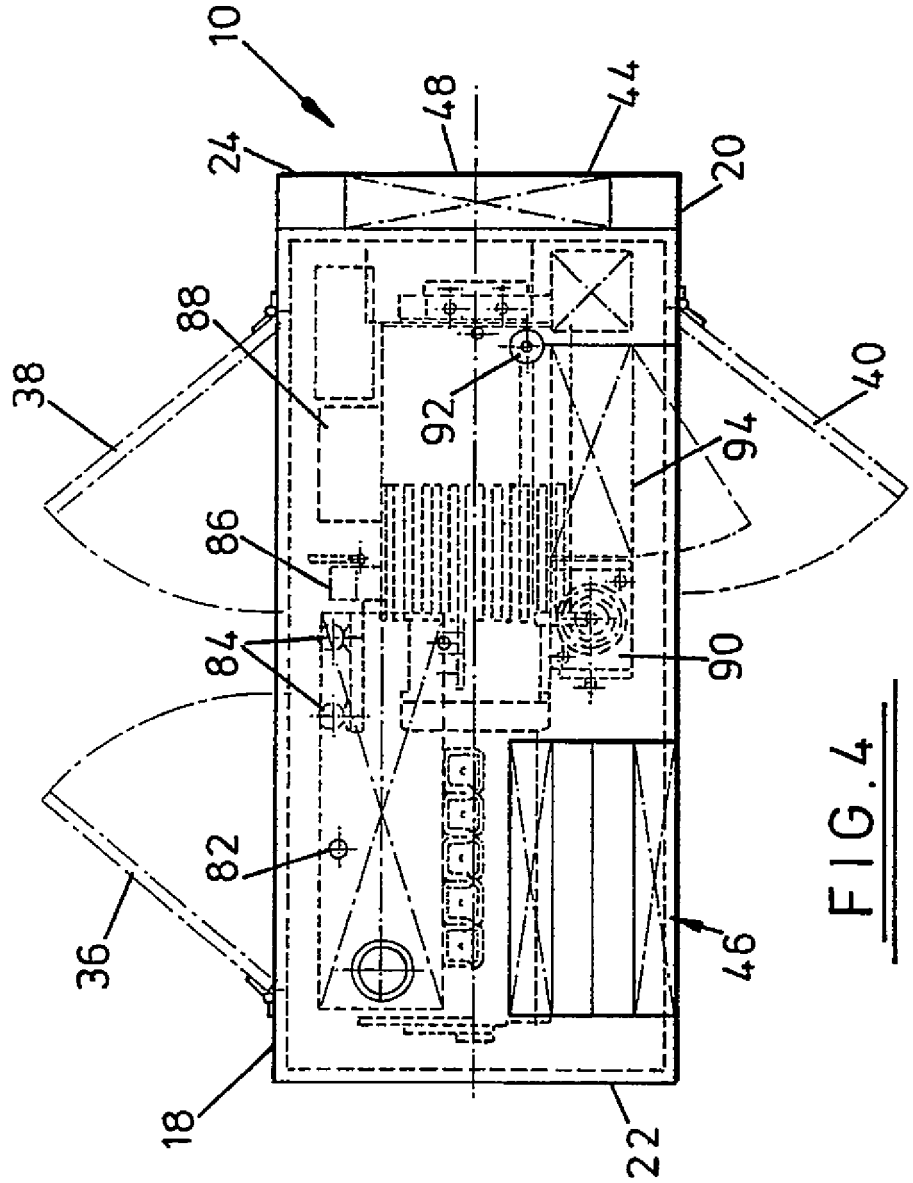

FIG. 4

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IMPROVEMENTS IN AND RELATING TO ENCLOSURES FOR GENERATOR SETS

This invention relates to an enclosure, and in particular, but not exclusively, to an enclosure for a generator set for use in exposed locations.

When mechanical or electrical devices are to be used in exposed locations, such as offshore gas or oil production platforms, the devices are normally designed to comply with appropriate International Protection (IP) Classifications. The Classifications set standards for various factors, including protection against water and dust ingress. For many devices it is relatively simple to provide enclosures which will provide the necessary protection, simply by appropriate use of sealing and gasketing. However, some devices, such as electrical generators, require cooling which is normally provided by a relatively large volume flow of cooling air. To be effective, the cooling air has to pass over or in close proximity to generator components which are sensitive to contamination by or ingress of water and airborne particles. Thus, for exposed locations, it is necessary to provide heat exchangers which isolate the cooling air from the external environment. The requirement to provide such heat exchangers adds considerably to the complexity and expense of such generators.

It is among the objects of the present invention to obviate or mitigate these disadvantages.

According to the present invention there is provided an enclosure for a generator set and suitable for use in exposed locations, the enclosure including a cooling air intake and a cooling air outlet, both arranged to prevent ingress of water, including salt water, and airborne particles to the enclosure.

The invention permits use of generator sets with little or no in-built weather protection and sealing in offshore, marine and other exposed locations. This allows far greater flexibility in the selection of the elements of the generator set for a particular application, and also reduces the expense involved in provision of a suitable generator set.

Preferably, the air intake includes coalescer means for removing airborne particles from the incoming air. Typically, the coalescer means defines a tortuous path provided with obstacles against which water and dust particles will impact as the incoming air passes therethrough, the path being arranged such that the air velocity during operation of the generator set is sufficient to ensure that such impacts take place. The coalescer means will further be provided with appropriate means for permitting collected water and dust particles to drain or fall away therefrom.

Preferably also, the enclosure air inlet is provided

with baffles for deflecting water and to prevent ingress of water other than that carried by the incoming air. Such baffles act to prevent water ingress while the generator set is not operating and the coalescer means is not fully effective, due to the absence of the operating air velocity.

Preferably also, the enclosure air inlet is provided with one or more air filters to provide an additional barrier to airborne solids.

Preferably also, the cooling air outlet includes means defining a tortuous air path to prevent ingress of water. Further, an external water deflector arrangement may be provided, as may appropriate water drainage arrangements. These features may be combined in an air outlet pod mounted on an outer wall of the enclosure, over the air outlet.

Preferably also, the air outlet is provided with means for preventing particle ingress when the generator set is not in operation, and there is no outflow of air from the outlet. Such means may take the form of one or more louvres arranged to open and close on start up and shut down of the generator set. The louvres may be operated by oil pressure from the generator engine or from another power source, or the louvres may be biassed to close in the absence of an outlet airflow, or the air pressure produced by such airflow. The biassing force may be provided by a spring or the louvres may simply utilise

gravity.

Preferably also, any access doors or removable panels provided in the external walls of the enclosure are provided with expandable seals, to prevent water ingress regardless of fabrication or weld distortion tolerances or variances.

This and other aspects of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of an enclosure in accordance with a preferred embodiment of the present invention;

Figure 2 is a front view of the enclosure of Figure 1;

Figure 3 is a rear view of the enclosure of Figure 1; and

Figure 4 is a plan of the enclosure of Figure 1.

The drawings illustrate an enclosure 10 in accordance with a preferred embodiment of the present invention, suitable for use on, for example, an unmanned offshore oil production platform. The enclosure 10 contains an air cooled internal combustion engine 12 and an alternator 14. Other than a connection to an external fuel tank, via a fuel inlet 16, the generator set is completely self-contained within the enclosure 10.

The enclosure 10 is generally cuboid in form and has side walls 18, 20, front and rear walls 22, 24, a roof 26 and a floor 28. The enclosure sits on a frame 30 formed

from I-beams, and the engine and alternator are mounted on a sub-frame 32 which itself sits on floor mounted vibration isolated mountings 34.

The side walls 18, 20 each include two access apertures, three of the apertures being provided with hinge mounted doors 36, 38, 40, and one of the apertures being provided with a bolted access panel 42. All of the doors and the panel are provided with expandable door seals so as to prevent water ingress, regardless of fabrication or weld distortion tolerances and variances. The door seals are selected such that deterioration does not take place as a result of repeated openings and closings.

The enclosure 10 is provided with a cooling air inlet 44 and a cooling air outlet 46, both of which are arranged to prevent ingress of water and airborne particles to the enclosure. The air inlet 44 includes an intake air coalescer 48, to remove water particles and solids from the inlet air stream. The coalescer 48 defines a tortuous path for the air to follow, including strategically placed obstacles against which the liquid droplets and solids will impact and thus drain or fall away from the coalescer through appropriate guidepaths. Proper operation of the coalescer relies upon the air velocity through the coalescer being within a set range, selected to encompass the cooling air flows required for normal operation of the generator set. However, when the generator set is not in

operation, it is still necessary that water ingress is prevented and for this reason the coalescer inlet is provided with external baffles 50 which act as water deflector plates. To provide a further barrier to airborne particles, the air inlet 44 may also include an air filter (not shown).

The air inlet 44 is provided in the rear wall of the enclosure 10, and on entering the enclosure through the air inlet 44 the cooling air is first utilized to cool the alternator 14, and then to cool the engine 12. The warmed air exits from the enclosure through the air outlet 46, which is provided in the enclosure roof 26. As may be seen more clearly in Figure 2, the outlet 46 is in direct communication with an outlet duct 54 leading from the engine 12.

The outlet 46 includes a rectangular duct section 56 which communicates with the engine duct 54, and the open end of the section 56 is positioned above the surface of the enclosure roof 26 and within an air outlet pod 58. The pod 58 includes an outer cover having a wall which extends below the upper end of the section 56, such that the outlet air must follow a tortuous path, indicated by arrow A, to exit from the pod 58. Further, the pod 58 provides for deflection of external water, such as rain and sea spray.

The engine exhaust outlet is provided with a similar, but somewhat smaller pod 60, to prevent ingress of water

into the engine exhaust.

As a safety feature, both the inlet and outlet 44, 46 are provided with respective firedampers 64, 66 having fusible links which permit the dampers to close in the event of a fire within or externally of the enclosure. The enclosure is also provided with appropriate gas and heat detectors 68, 70.

The enclosure 10 also provides a weatherproof enclosure for the various ancillary components associated with the enclosure set including starter batteries 72, junction boxes 74, a fuel filter 78, an exhaust silencer 80, a lubrication oil fill point, filters and drain pumps 82, 84, 86, an outgoing terminal box 88, a fuel break tank 90, a fuel break tank vent 92 and an instrument panel 94, which is visible through a viewing window 96 provided in the door 40.

The enclosure is designed to meet or surpass the International Protection (IP) Classification IP56. The first digit of the rating indicates the level of dust ingress that is acceptable, while the second digit indicates that the equipment must be able to withstand strong jets of water with permitted limited ingress, insufficient to cause damage to the equipment within the enclosure. By providing an enclosure providing this level of protection it is not necessary that the generator set and ancillary equipment have a particularly high rating. This leads to a considerable reduction in the cost of the

generator set as the IP rating of the set may be considerably lower than if the enclosure 10 had not been provided, for example: alternators which have been brought to an IP 55 rating are very expensive.

It will be obvious to those of skill in the art that the above described embodiment is merely exemplary of the present invention and that various modifications and improvements may be made thereto, for example: the air outlet may be provided with louvres arranged to open and close on start-up and shutdown of the generator set, to prevent particle ingress when the generator set is not in operation, and there is no outflow of air.

CLAIMS

1. An enclosure for a generator set and suitable for use in exposed locations, the enclosure including a cooling air intake and a cooling air outlet, both arranged to prevent ingress of water, and airborne particles to the enclosure.

2. The enclosure of claim 1 wherein the air intake includes coalescer means for removing airborne particles from the incoming air.

3. The enclosure of claim 2 wherein the coalescer means defines a tortuous path provided with obstacles against which water and dust particles will impact as the incoming air passes therethrough, the path being arranged such that the air velocity during operation of the generator set is sufficient to ensure that such impacts take place.

4. The enclosure of claim 3 wherein the coalescer means is further provided with appropriate means for permitting collected water and dust particles to drain or fall away therefrom.

5. The enclosure of any one of the preceding claims wherein the air intake is provided with baffles for

deflecting water and to prevent ingress of water other than that carried by the incoming air.

6. The enclosure of any one of the preceding claim wherein the enclosure air intake is provided with one or more air filters.

7. The enclosure of any one of the preceding claims wherein the cooling air outlet includes means defining a tortuous air path to prevent ingress of water.

8. The enclosure of any one of the preceding claims wherein the cooling air outlet includes an external water deflector arrangement.

9. The enclosure of claim 7 or claim 8 wherein an air outlet pod is mounted on an outer wall of the enclosure, over the air outlet.

10. The enclosure of any one of the preceding claims wherein the air outlet is provided with means for preventing particle ingress when the generator set is not in operation, and there is no outflow of air from the outlet

11. The enclosure of anyone of the preceding claims wherein the means for preventing particle ingress are in

the form of one or more louvres arranged to open and close on start up and shut down of the generator set.

12. The enclosure of any one of the preceding claims wherein all access doors or removable panels provided in external walls of the enclosure are provided with expandable seals.

13. The enclosure substantially as described herein and as illustrated in the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) -12-	Application number GB 9311648.1
Relevant Technical Fields (i) UK Cl (Ed.M) H2A (AKB2); F4V (VFD, VFYA, VGAA, VGAC) (ii) Int Cl (Ed.5) H02K 5/00, 5/04, 5/10; F24F 7/00 13/00	Search Examiner A N BENNETT Date of completion of Search 2 MARCH 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASES : WPI	Documents considered relevant following a search in respect of Claims :- 1-10, 12

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&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2112585 A	(REMS-WERK) - whole document	1-4, 6, 10
X	GB 2062361 A	(HILTI) - whole document	1-10

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